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Research Note

Gastrointestinal Helminths of *Eleutherodactylus johnstonei* (Leptodactylidae) from Bermuda

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ABSTRACT: Eighty-four leptodactylid frogs, *Eleutherodactylus johnstonei*, were collected in August 1992 from St. George's Parish, Bermuda, and examined for gastrointestinal helminths. Forty-five (54%) harbored 1 or more species of nematode: 18 with *Aplectana* sp. (21% prevalence, mean intensity 6.6 ± 2.2 SE), 25 with *Parapharyngodon garciae* (30%, 1.5 ± 0.2 SE), and 3 with larval physalopterans (4%, 1.7 ± 0.7 SE). *Eleutherodactylus johnstonei* represents a new host record for each of these species of nematodes.

KEY WORDS: Nematoda, *Aplectana* sp., *Parapharyngodon garciae*, physalopteran larvae, *Eleutherodactylus johnstonei*, Leptodactylidae.

The leptodactylid frog, *Eleutherodactylus johnstonei* Barbour, 1914, is known from Antigua, Barbados, Barbuda, Grenada, Guadeloupe, Jamaica, Montserrat, Nevis, Saba,

St. Barthélemy, St. Christopher, St. Eustatius, St. Lucia, St. Martin, and St. Vincent and is found from sea level to 853 m (Schwartz and Henderson, 1991) on these Caribbean islands. *Eleutherodactylus johnstonei* was accidentally introduced into Bermuda, probably from Jamaica, about 1886 (Pope, 1917). To our knowledge, there are no previous reports of helminths from this frog. The purpose of this report is to report the gastrointestinal helminths of *E. johnstonei* from Bermuda.

Eighty-four *E. johnstonei* (mean snout–vent length = $24.6 \text{ mm} \pm 0.4$ SE, range 11–31) were hand-collected on the grounds of the Bermuda Biological Station for Research, St. George's Parish ($64^{\circ}42'N$, $32^{\circ}22'W$), Bermuda, 14–18 August

Table 1. Records of *Aplectana* spp. in eleutherodactylid frogs.

Host	<i>Aplectana</i>	Locality	Reference
<i>Eleutherodactylus acmonis</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
<i>E. albipes</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. coqui</i>	<i>Aplectana</i> sp.	Puerto Rico	Schmidt and Whittaker, 1975
<i>E. cuneatus</i>	<i>Aplectana</i> sp.	Cuba	Barus, 1972
	<i>Aplectana cubana</i> *	Cuba	Barus, 1972
	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. dimidiatus</i>	<i>Aplectana</i> sp.	Cuba	Barus, 1972
	<i>Aplectana cubana</i> *	Cuba	Barus, 1972
	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. eileenae</i>	<i>Aplectana</i> sp.	Cuba	Barus, 1972
	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
<i>E. gundlachi</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. johnstonei</i>	<i>Aplectana</i> sp.	Bermuda	This paper
<i>E. klinikowskii</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. locustus</i>	<i>Aplectana</i> sp.	Puerto Rico	Schmidt and Whittaker, 1975
<i>E. pinarensis</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
<i>E. planirostris</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
<i>E. richmondi</i>	<i>Aplectana</i> sp.	Puerto Rico	Schmidt and Whittaker, 1975
<i>E. sierramaestrae</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. symingtoni</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
	<i>Aplectana hamatospicula</i>	Cuba	Coy Otero and Ventosa, 1984
<i>E. turquiniensis</i>	<i>Aplectana cubana</i> *	Cuba	Coy Otero and Ventosa, 1984
<i>E. zeus</i>	<i>Aplectana hamatospicula</i>	Cuba	Coy otero and Ventosa, 1984
<i>E. zugi</i>	<i>Aplectana cubana</i> *	Cuba	Barus, 1972

* *Species incertae sedis*, only females are known.

1992. The sample consisted of 28 males and 56 females. The frogs were sacrificed by an overdose of ethanol, and the abdominal wall was slit to allow rapid penetration of fixative and then immersed in 10% formalin.

The body was opened by a longitudinal incision from throat to vent and the gastrointestinal tract was removed by cutting across the anterior esophagus and rectum. The esophagus, stomach, small intestine, and large intestine were examined separately under a dissecting microscope. Nematodes were removed and identified utilizing the standard glycerol wet mount procedure.

Seventeen of 28 (61%) males and 28 of 56 (50%) females were parasitized. Prevalence and mean intensity are used in accordance with Margolis et al. (1982). Since no male *Aplectana* was found, identification to species was not possible. *Aplectana* sp. (21% prevalence, mean intensity 6.6 ± 2.2 SE) and *Parapharyngodon garciae* Schmidt and Whittaker, 1975 (30% prevalence, mean intensity 1.5 ± 0.2 SE), were found in the

small and/or large intestines, while larval physalopterans (4% prevalence, mean intensity 1.7 ± 0.7 SE) were found in the coelom. There was no significant difference in prevalence of infection between male and female frogs (chi-square = 0.25, 1 df, $P > 0.05$). Four male frogs (14%) harbored *Aplectana* sp. only; 14 female frogs (25%) harbored *Aplectana* sp. only; 12 male frogs (43%) harbored *P. garciae* only; 13 female frogs (23%) harbored *P. garciae* only; 1 male frog (4%) harbored larval physalopterans; and 1 female frog (2%) harbored larval physalopterans. Only 1 female frog harbored 2 species of nematodes, *Aplectana* sp. and larval physalopterans.

Likewise, there was no significant difference in prevalence of infection by nematode species between male and female frogs (*Aplectana* sp., chi-square = 0.62, 1 df, $P > 0.05$; *P. garciae*, chi-square = 2.86, 1 df, $P > 0.05$; larval physalopterans, not tested). These helminths, to our knowledge, represent the first nematodes recovered from *E. johnstonei* and are new host records.

Selected nematode specimens were placed in 70% alcohol in glass vials and deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705: *Aplectana* sp. (83567); *Parapharyngodon garciae* (83569); larval physalopterans (83568). All frog specimens were deposited in the herpetology collection of the Natural History Museum of Los Angeles County, LACM 140695–140778.

None of the parasites found in this study are unique to *E. johnstonei*. *Aplectana* spp. were previously reported from 16 species of *Eleutherodactylus* (Table 1). *Parapharyngodon garciae* was first described from *Eleutherodactylus antillensis* and *Eleutherodactylus portoricensis* from Puerto Rico by Schmidt and Whittaker (1975) and, until this report, represented the only host species. Barus (1972) found a physalopteran larva in a stomach cyst in *Eleutherodactylus cuneatus* from Cuba (1 of 46, 2%) which he identified as *Abbreviata* sp. Measurements of the physalopteran larvae found in our current study on *E. johnstonei* are similar to those reported by Barus (1972). These larvae were encysted on organ surfaces, which suggests to us that *E. johnstonei* were paratenic hosts only. No adult *Abbreviata* sp. has been reported from any species of *Eleutherodactylus*; however, Baker (1987) reported *Physalopteroides valdesi* in *Eleutherodactylus dimidiatus* and *Eleutherodactylus turquinensis*.

The genus *Eleutherodactylus* contains over 400 species, which are primarily neotropical in distribution (Zug, 1993). Schwartz and Henderson (1991) list 124 species from the Caribbean. There are currently reports of helminths from only 23 eleutherodactylid species (Baker, 1987) or approximately 6% of the genus. These average 2.5 ± 0.3 SE (range 1–6) helminth species per eleuth-

erodactylid species. Clearly, helminthological surveys of many more species of *Eleutherodactylus* are needed before there can be discussion of helminth diversity within this very large genus.

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